



Natural Water Retention Measures

www.nwrn.eu

Service contract n°07.0330/2013/659147/SER/ENV.C1

Case Study Seymaz River renaturation



This report was prepared by the NWRM project, led by Office International de l'Eau (OIEau), in consortium with Actéon Environment (France), AMEC Foster Wheeler (United Kingdom), BEF (Baltic States), ENVECO (Sweden), IACO (Cyprus/Greece), IMDEA Water (Spain), REC (Hungary/Central & Eastern Europe), REKK inc. (Hungary), SLU (Sweden) and SRUC (UK) under contract 07.0330/2013/659147/SER/ENV.C1 for the Directorate-General for Environment of the European Commission. The information and views set out in this report represent NWRM project's views on the subject matter and do not necessarily reflect the official opinion of the Commission. The Commission does not guarantee the accuracy of the data included in this report. Neither the Commission nor any person acting on the Commission's behalf may be held Key words: Biophysical impact, runoff, water retention, effectiveness - Please consult the NWRM glossary for more information.

*NWRM project publications are available at
<http://www.nwrn.eu>*

Table of content

I. Basic Information.....	1
II. Policy context and design targets	1
III. Site characteristics.....	2
IV. Design & implementation parameters.....	3
V. Biophysical impacts	4
VI. Socio-Economic Information.....	6
VII. Monitoring & maintenance requirements.....	7
VIII. Performance metrics and assessment criteria	8
IX. Main risks, implications, enabling factors and preconditions	8
X. Lessons learned.....	9
XI. References.....	9
XII. Photos Gallery	10

I. Basic Information

Application ID	<i>Switzerland_01</i>		
Application Name	Seymaz river renaturation		
Application Location	Country:	Switzerland	Country 2:
	NUTS2 Code	7	
	River Basin District Code	CH50	
	WFD Water Body Code		
	Description	Seymaz river is located in the eastern part of Geneva canton.	
Application Coordinates	Site	Latitude: 46,198248	Longitude: 6,180665
Target Sector(s)	Primary:	Hydromorphology	
Implemented NWRM(s)	Measure #1:	N5	
	Measure #2:	N9	
	Measure #3:	N2	
Application description	short	The Seymaz renaturation project consists in several renaturation measures: eliminating concrete casts, softing riverbanks and widening riverbed. A wetland (marshland) is also re-created.	

II. Policy context and design targets

Brief description of the problem to be tackled	The Seymaz renaturation project is part of the cantonal program which aims at improving ecological and countryside quality and reducing flood risk by managing peakflows.		
What were the primary & secondary targets when designing this application?	Primary target #1:	Biodiversity and gene-pool conservation in riparia	
	Secondary target #1:	Flood control and flood risk mitigation	
	Remarks		
Which specific types of pressures did you aim at mitigating?	Pressure #1:	WFD indentified pressure	<i>4.1.2 Physical alteration of channel/bed/riparian area/shore of water body for agriculture</i>
	Pressure #2:	WFD indentified pressure	4.3.1 Flow diversions/hydrological alteration – agriculture
	Pressure #3:	Floods Directive indentified pressure	Other pressure contributing to flooding /flood risk
	Remarks	Aimed pressures correspond to the pressures which have been selected in the list of WFD and Flood directives pressures, even if Switzerland	

CS: Seymaz River renaturation, Switzerland

		does not depend on EU Directives.	
Which specific types of adverse impacts did you aim at mitigating?	Impact #1:	WFD indentified impact	Altered habitats due to hydrological changes
	Impact #2:	Floods Directive indentified impact	Property
	Impact #3:	Floods Directive indentified impact	Landscape
	Impact #4:	Floods Directive indentified impact	Rural Land Use
	Remarks	Aimed impacts correspond to the pressures which have been selected in the list of WFD and Flood directives pressures, even if Switzerland does not depend on EU Directives.	
Which EU requirements and EU Directives were aimed at being addressed?	Switzerland is not part of EU.		
Which national and/or regional policy challenges and/or requirements aimed to be addressed?	The project aims at improving rivers ecological and landscape quality and reducing flood risks. Those requirements are mentioned by a federal legislation (Law on rivers constructions in 1991 and ordonance on water protection in 1998) and aimed by the program implemented by Geneve State (Renaturation framework Action Plan in 1999).		

III. Site characteristics

Dominant Land Use type(s)	Dominant land use	211
	Secondary land use	112
	Other important land use	221
	Agricultural land use includes cereals, and some vineyards and market gardening crops. Artificial land is mostly for residential use.	
Climate zone	cool temperate moist	
Soil type	Silt clay	
Average Slope	very gentle (1-2%)	
Mean Annual Rainfall	900 - 1200 mm	
Mean Annual Runoff	Select the Mean Annual Runoff value	
Average Runoff coefficient (or % imperviousness on site)	Select the Average Runoff Coefficient value	0 - 10%
	The % imperviousness on the urban part of the watershed could increase up to 14 or 25% given the predicted constructions.	
Characterization of water quality status (prior to the implementation of the NWRMs)	<p>Prior to the implementation of the NWRM, water physico-chemical quality was bad upstream until 2001 and downstream until 1981. It became "medium" then. Water contained nitrates, phosphorous, organic carbon, metals and pesticides. Main causes are industrial and agricultural pollution.</p> <p>Biological quality was medium upstream and bad downstream. It did not cope with cantonal requirements but was improving.</p>	

Comment on any specific site characteristic that influences the effectiveness of the applied NWRM(s) in a positive or negative way	Text <i>Positive way:</i>
	Text <i>Negative way:</i>

IV. Design & implementation parameters

Project scale	Medium (eg. public park, new development district)	Project scale corresponds to the Seymaz river and its neighboring lands.
Time frame	Date of installation/construction (01.1998)	Some punctual measures were implemented between 1998 and 2005, when the so-called “renaturation program” began.
	Expected average lifespan (life expectancy) of the application in years	The measure is expected to be perennial
Responsible authority and other stakeholders involved	<i>Name of responsible authority/ stakeholder</i>	<i>Role, responsibilities</i>
	1. Grand Conseil and Conseil d’Etat of Genève State	Responsible for voting two laws/programs on Seymaz renaturation
	2. Geneve Canton: General Direction of Water, renaturation of rivers and banks service ; General Direction of Nature and Landscape ; Agriculture and the environment Department	Responsible authority for the implementation of the renaturation program
	3. Members of the Charte Seymaz group (all actors concerned by the project)	“negociation” group on the renaturation program
	4. Members of the management group	Responsible for coordinating and managing the local arrangements
	5. Farmers	Impacted stakeholders who had to comply with some arrangements
The application was initiated and financed by	Genève State	
What were specific principles that were followed in the design of this application?	Principal principles followed in the design of this application have been: - acceptability through participative process and governance - compatibility with local economic activities (farming) - acceptable costs - public perception and social benefits (tourism)	
Area (ha)	Number of hectares treated by the NWRM(s).	2920
	Text to specify	The Seymaz watershed covers 3660ha and is divided in two sub-basins; the one upstream, located in a rural area and

CS: Seymaz River renaturation, Switzerland

		concerned by the NWRM is 2920ha.
Design capacity	About 800 000m ³ can be retained in the treated area thanks to several NWRM and some other retention ponds.	
Reference to existing engineering standards, guidelines and manuals that have been used during the design phase	<i>Reference</i>	
	1.	
	2.	
	3.	
	4.	
	5.	
Main factors and/or constraints that influenced the selection and design of the NWRM(s) in this application	<p>Land use constraints have been the initiator factor to the implementation of the measure, since frequent floods happened to occur on farmlands in the Seymaz basin itself, linked to the artificialisation of the river during the past centuries. Floods in the urban areas downstream were already a problem.</p> <p>Political context, legislation and existing funding sources have been a main factor leading the choice for the implementation of the NWRM, instead of “traditional” works for flood management.</p> <p>A main constraint have been the nature of land use and property in the area concerned by the NWRM, since famers were mostly impacted by the project and first opposed to it. Negotiation have finally enabled to choose the NWRM and have impacted on the way to implement it.</p>	

V. Biophysical impacts

Impact category (short name)	Impact description (Text, approx. 200 words)	Impact quantification (specifying units)	
		Parameter value; units	% change in parameter value as compared to the state prior to the implementation of the NWRM(s)
Impact on soil moisture and soil storage capacity	Sionnet marshland have been restored; they can retain up to 800 000m ³ . Water is stored and released regarding period of the year, between flood and drought periods. This contributes to reduce runoff and flood risks in urban areas and to regulate water flow.	Water retention: 800 000 m ³	
Runoff attenuation / control	Infiltration in riverbeds is higher. Erosion is limited but enough for ecosystems.	Max Peak flow: 17m ³ /s	
Reducing flood risks (Floods Directive)	Water retention could also have an impact on flow replenishment but this still need to be proved. It improves the biological environment.		
Mitigation of other biophysical impacts in relation to other EU Directives (e.g. Habitats,	Moreover, Seymaz renaturation have recreated a wetland habitat which acts as a refuge for fauna and is a resting place for migratory birds. Flora such as rubanier dressé, lâche faux souchet, scrofulaire auriculée, samole de Valerand and lagratiolle officinale can now be observed in the wetland. Such species are priority in Switzerland and concerned by specific	3 rd geneve site for	

CS: Seymaz River renaturation, Switzerland

<p>UWWT, etc.)</p> <p>Water quality Improvements</p> <p>Select from the drop-down menu below:</p> 	<p>action plans. Farm plants such as bleuet, épiaire annuelle, véronique luisante, linaires élatine, linaires bâtardes, renoncule scélérate and bident triparti are also observed. Seymaz river is also recognized as a nesting site for amphibians.</p> <p>Water quality have improved after renaturation (from medium to good) but it still needs to be monitored.</p>	<p>migratory birds</p> <p>good</p>	<p>Bad/medium</p>
<p>Runoff attenuation / control</p> <p>Peak flow rate reduction</p> <p>Impact on groundwater</p> <p>Impact on soil moisture and soil storage capacity</p> <p>Restoring hydraulic connection</p> <p>Water quality Improvements</p> <p>WFD Ecological Status and objectives</p> <p>Reducing flood risks (Floods Directive)</p> <p>Mitigation of other biophysical impacts in relation to other EU Directives (e.g. Habitats, UWWT, etc.)</p> <p>Soil Quality</p>	<p><i>Describe the impact on runoff reduction and/or control</i></p>		

CS: Seymaz River renaturation, Switzerland

Improvements	
Other	

VI. Socio-Economic Information

What are the benefits and co-benefits of NWRMs in this application?	<p>Direct benefits of the implementation of the measure are</p> <ul style="list-style-type: none"> - reduction of flood damages in urban areas (houses, school, roads...) <p>Indirect benefits are:</p> <ul style="list-style-type: none"> - creation of a touristic area for the inhabitants of Geneve canton. Frequency of hikers, cycles and horse riders visits have increased. Visits are also organized for ornithology. The area now benefits from a positive image which has a positive impact on tourism. - benefit for farmers by selling products on their farm, due to this increasing number of visitors - landscape conservation - employment (agritourism, works) 		
Financial costs	Total:	61 million €	
	<i>Capital:</i>	22 million €	Investments financed by specific laws on renaturation
	<i>Land acquisition and value:</i>	1.6 million € at least	This amount was transferred from the renaturation department to the regional agriculture promotion fund in order to finance compensations linked to losses of agricultural lands
	<i>Operational:</i>	37 million €	Including: 15 million € for works financed by Cantonal renaturation fund 22 million € for functioning
	<i>Maintenance:</i>		
Were financial compensations required? What amount?	Was financial compensation required: Yes		
	Total amount of money paid (in €): at least 1,6 million €		
	<p>Compensation schema: farm owners and farmers have received financial compensation, either for selling their land (1.6€/m² in addition to the sale) or keeping it and managing it respecting a “nature contract” (819€/ha). The payment was function of the number of concerned hectares. Moreover, punctual compensations have been done, for instance during works periods and for a loss of three year yields during when land was leveled. Farmers also beneficiated for tax advantages.</p> <p>The State also created a fund for regional agriculture promotion, beneficiating for land sales. The renaturation department transferred 1,6million € to this fund.</p>		
Economic costs	<i>Actual income loss:</i> The measure worsens the agronomic quality of lands; the loss have been estimated at 1.6€/m ² .		
	<i>Additional costs:</i>		
	<i>Other opportunity costs:</i>		

CS: Seymaz River renaturation, Switzerland

	<i>Comments / Remarks:</i>
Which link can be made to the ecosystem services approach?	<ul style="list-style-type: none"> - Flood security and protection: reduction of flood damages in urban areas (houses, school, roads...) - Amenities (associated to habitat protection): fish and plants, tourism, recreation, and others: - creation of a touristic area for the inhabitants of Geneve canton. The area now benefits from a positive image which has a positive impact on tourism. - benefit for farmers by selling products on their farm, due to this increasing number of visitors - landscape conservation - employment (agritourism, works)

VII. Monitoring & maintenance requirements

Monitoring requirements	<p>Water flows are measured in different sites of Seymaz river (at least 3). Water quality is monitored:</p> <ul style="list-style-type: none"> - physic-chimical quality (every 6 years) through parameters: nitrogen, phosphorous, metals, pesticides, organic carbon - ecological quality (between every 1 to every 8 years) through two parameters: benthic macrofauna and diatomees
Maintenance requirements	A management plan has been elaborated in 2007 to describe maintenance requirements for habitats protection and flood risk management.
What are the administrative costs?	

VIII. Performance metrics and assessment criteria

Which assessment methods and practices are used for assessing the biophysical impacts?	Biophysical impacts are assessed by comparing previous and post state of habitats and flood risk.
Which methods are used to assess costs, benefits and cost-effectiveness of measures?	Cost effectiveness of measure is assessed comparing the cost of the actual NWRM with the cost of the initial project which was planned to fight floods, supposing the impacts would have been similar.
How cost-effective are NWRM's compared to "traditional / structural" measures?	The NWRM cost is around 74 millions CHF, or 5,5 millions CHF per year, whereas the initial project cost was 95 millions CHF.
How do (if applicable) specific basin characteristics influence the effectiveness of measures?	The Seymaz basin includes an old marshland, which had been drought in the past centuries. Its renaturation enabled to use its natural storage potential which is necessarily higher than other types of lands potential.
What is the standard time delay for measuring the effects of the measures?	The effect of the NWRM regards mostly floods and will be able to be measured when flood events occur. In 20 years, biodiversity have notably increased.

IX. Main risks, implications, enabling factors and preconditions

What were the main implementation barriers?	<p>Main implementation barriers have been:</p> <ul style="list-style-type: none"> - the importance of property rights, mostly farmers ones, and the difficulty to deal with land property - the negotiation with farmers, highly impacted by the project and who were initially “against” a total renaturation project. Their involvement in the decision process, the negotiation of compensations and decisions such as the non-expropriation of farmers or the “drainage right”, had to be discussed and taken into account. - previous conflicts that had occurred between farmers and nature organizations - non-expropriation has finally became a conflict factor
What were the main enabling and success factors?	<p>Main success factors have been:</p> <ul style="list-style-type: none"> - the local political context, much more in favor of renaturation than other cantons (laws, fund...) - local arrangements such as the “drainage right” given t farmers - the high participation rate of farmers and other actors in the process decision and implementation (through Charte Seymaz group)
Financing	<p>The main funding sources were:</p> <ul style="list-style-type: none"> - the cantonal renaturation fund (45millions CHF) - the two laws on renaturation voted by Geneve State (27 million CHF) <p>Incentives were used through compensations forward famers who sold their land or sign in a “nature contract” regarding the way to manage it.</p>

CS: Seymaz River renaturation, Switzerland

	Private funding has been made.
Flexibility & Adaptability	<i>Changing political context and local governance could have been a barrier to the implementation of the renaturation project. Another type of major land use and economic activity in the Seymaz river basin could have make the process easier or not. Compensations could have been higher for lands that can be built.</i>
Transferability	<p>Similar application can be proposed in other contexts where water retention has drastically decreased in the past and where a retention potential is known (ancient wetland for instance).</p> <p>Land use characteristics and economic activities of other basins highly impact the possibility of implementing such NWRM, and the decisions, compensations and local arrangements that can be made. This implementation highly depends on land property characteristics (rate, type of owners, land use possibilities...).</p> <p>Necessary preconditions seem to be a participative decision process, involving the main impacted stakeholders (economically and regarding their property rights). The participative process, which can be considered as a success factor, is adaptable to other contexts. A favorable political context and financing possibilities is another precondition for the implementation of the NWRM.</p>

X. Lessons learned

Key lessons	<p>The project has enabled land use regulation through social solidarity and economic efficiency, taking local interests into account in addition to global interests (regarding floods and biodiversity). This can have facilitated the acceptance and success of its implementation.</p> <p>Moreover, the measure happens to be more cost-efficient than previous projects of flood regulation.</p>
-------------	---

XI. References

Source Type	Project presentation factsheet Grey Literature Project report
Source Author(s)	Département du territoire, Service de renaturation des cours d'eau, Canton de Geneve (Genece State, Land department, Service of rivers renaturation) Johan Imesch Francesco Della Casa
Source Title	La Seymaz Les arrangements locaux et la durabilité de nouvelles activités rurales : le cas de la renaturation de la Haute-Seymaz (local arrangements and sustainability of new rural activities : the Haute-Seymaz renaturation case study) Renaturation de la Seymaz (Seymaz renaturation)
Year of publication	2009 2011 2007
Editor/Publisher	Canton de Geneve IDHEA, Chaire Politiques publiques et durabilité

CS: Seymaz River renaturation, Switzerland

	Tracés, bulletin technique de la Suisse romande		
Source Weblink	www.ge.ch/eau		
Key People		<i>Name / affiliation</i>	<i>Contact details</i>
	1.		
	2.		
	3.		
	4.		

XII. Photos Gallery

Figure 1. Before and after Seymaz renaturation. Source: Canton de Genève, 2011



Figure 2. Sionnet marshland along the Seymaz river, after renaturation. Source: Canton de Genève, 2011